

ICT for Knowledge

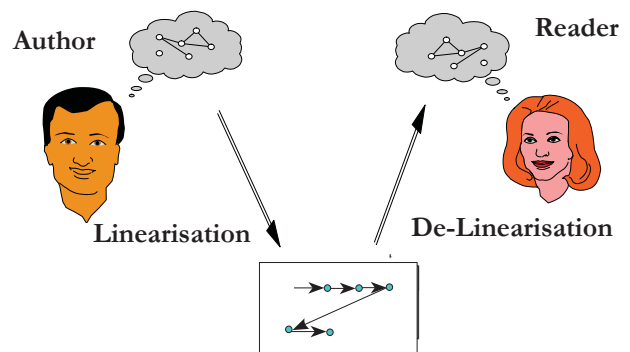
Prof. Athula Ginige

In the last 60 years there have been many advances in Information and Communication Technologies (ICT) starting with the invention of the first electronic general-purpose computer ENIAC in 1946. This growth accelerated with the World Wide Web (WWW) becoming a publicly available service on the Internet in 1991.

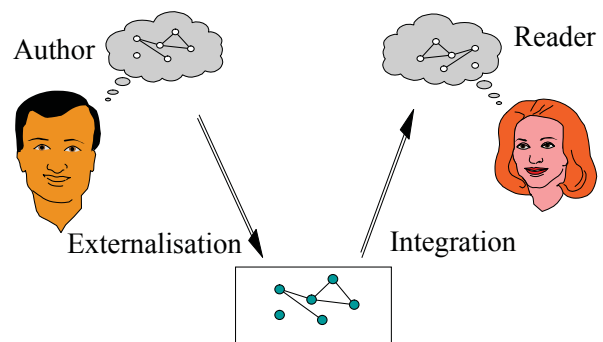
These new Information and Communication Technologies have started to impact on many things that we do in our day to day life. These include the way businessman conduct their business operations, the way people learn, the way people govern themselves, the way health care is provided etc. Now there is an old way of doing things and a new way of doing things. The old ways of doing things now need to transform into new ways of doing things using the Internet and the Web. This transformation is called eTransformation. The letter “e” is often added in front of the old names to separate the new ways of doing things from the old ways of doing things. Thus Business became eBusiness, Learning became eLearning, Health became eHealth, Government became eGovernment.

Information and Communication Technologies have also greatly impacted on the way we generate, access and process knowledge. What is knowledge is still a subject of a philosophical debate that started with Plato’s formulation of knowledge as "justified true belief". In our daily usage we talk about knowledgeable people as well as body of knowledge. Knowledge has two components: external knowledge or body of knowledge which represents what is known in a particular field in terms of facts and information that is stored in different places and sources such as libraries and records that can be shared among people. This external knowledge can be documented or codified. Second component is internal which resides in the minds of people. This knowledge cannot be

Writing and Reading Using print



Writing and Reading using Hypermedia



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easily documented. This component of knowledge represents the expertise or set of skills acquired by a person. It is a cognitive event that takes place inside people's heads. It consist of know-how, craft, knowing how to follow instructions and procedures, knowing why, not simply when, things happen.

Wisdom is thought to be the collective and individual experience of applying knowledge to solve problems. Wisdom involves where, when and how to apply knowledge.

Thus a main form of gaining knowledge is by acquiring and understanding the relevant information or by observing an expert. Further by reflecting on new information that were acquired (ie exploring what it really mean) and by practicing what is being observed one can enhance one's knowledge.

In 1945 Dr. Vannevar Bush who coordinated the activities of some six thousand leading American scientists proposed the concept of linking related ideas across documents so that we can navigate the related ideas following these links in his article "As We May Think". He was trying to find out a way to make the very large amount of scientific knowledge that got created during the Word War 1 more accessible to scientists. The wide scale implementation of this idea of linking related documents happened only after the invention of the World Wide Web.

In ancient times students went to teachers (*Dissapamok*) house and lived there for a period of time just to do this. They mainly acquired the information by listening to the teacher and learned the skills by observing the teacher. As the main form of sharing information was verbal, everyone had to be in the same place at the same time to acquire the information. This made gaining new knowledge a very difficult task.

In ancient times the knowledge was mainly passed on from generation to generation by elders in a community reciting stories that had essential information to the next generation. This was augmented to a very small degree by people learning to draw pictures in caves, stones and much later on early forms of paper (*Puskola Poth*). There was no way to mass produce and distribute this early writing until the printing press was invented.

The ability to print greatly changed the way people can share and acquire knowledge. The experts were able to document their knowledge using text and pictures. These were then printed and distributed as books. Once people acquired the book, they were able to read and understand at a place and a time convenient to them. People who understood the experts' knowledge was able to teach others. The schools started to be opened in every town and village to assist people to acquire the information and convert that into knowledge.

With the invention of the printing press, knowledge became a lot more accessible to people. Yet getting access to the required information was an expensive process. Thus learning was limited to quite a few in the society. Once a book is created keeping the information up-to-date with printing of new issues was also an expensive and time

consuming process. Finding required information among the vast number of books that have been published overtime became another challenge. In schools teachers who had expertise in few areas shared that knowledge with the students. By learning from many teachers students were able to acquire a broad range of skills and knowledge. Instead of going to a teacher's house that is normally far away and living there for a period of time, students were able to attend a school not too far from home.

Libraries started to create indexes to make it easy for people to find the information they are looking for. In the early days these took the form of assigning a number what consists of many parts based on a hierarchical subject classification scheme to a book and recording this information on a card index. In 1945 Dr Vannevar Bush who coordinated the activities of some six thousand leading American

scientists proposed the concept of linking related ideas across documents so that we can navigate the related ideas following these links in his article “As We May Think”. He was trying to find out a way to make the very large amount of scientific knowledge that got created during the World War 1 more accessible to scientists. When we are thinking we think of different ideas and how these are related together. Then we try to write these in a linear manner. When we are reading from a book, often we read in a linear manner. Then we break what we read into different ideas and organize these and link with the ideas we already have. Thus this concept of linking related ideas is very natural to the way we think.

Many people from time to time tried to apply the idea Dr Vannevar Bush described in his article. The wide scale implementation of this idea of linking related documents happened only after the invention of the World Wide Web.

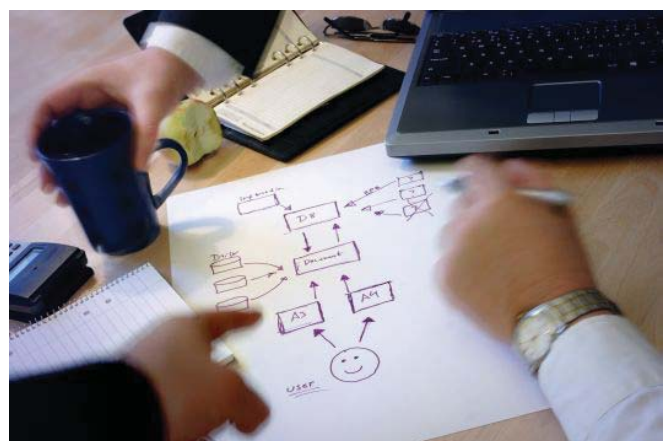
Tim Berners-Lee trying to solve the problem of how physicists from around the world can share data, with no common machines and no common presentation software, developed the World Wide Web (WWW). In August 1991 World Wide Web (WWW) became a publicly available service on the Internet. In a very short time this revolutionized the way we share information and in turn how we generate, store and access external knowledge.

Another development of ICT that enhanced various aspects of knowledge processing was the ability to capture and process various media types on a computer. Today computers are capable of not only displaying text, but images, animations, video as well as capturing and play back of sound. These multimedia capabilities coupled with the easy access to information provided by the web technologies opened up many new opportunities for generating and sharing knowledge.

The impact the multimedia capable web had on generating and sharing knowledge can be best understood by analyzing how the Web in this short period evolved from Web 1.0 to Web 2.0 and now to Web 3.0

The Web initially started based on a producer consumer model. The people who produced information published this information on the web for people who wants this information to consume it. Over a period of time this gave people access to large amount of information. Many professional organizations such as health institutions, research institutions, universities and various Government organizations started to publish the information about their work on the web. To find required information, people had to know the name of the web site; the URL (Universal Resource Locator). When the number of websites started to grow it became impossible for people to know and remember all these URLs.

This problem was solved when people discovered the technologies to create web search engines. Some popular early search engines were AltaVista and Yahoo. These search engines had web crawlers visiting every webpage on the Internet and creating index terms based on the contents in the web pages. When people submit search terms to the search engine it matches these search terms with the index it has created and send the URLs of the pages that has terms matching the search terms to the user. Then came a new search engine: Google. This had a new way to find the web pages that users want. In addition to using terms in the web page to match with the search term provided by the user Google also looked at web pages that are pointing to a web page and the contents in these pages. For the first time Google took into account what other people are saying about a webpage by analysing the link structure when finding relevant web pages to a user query. Today Google is an effective and widely



used web search engine. It was able to achieve this status by harnessing the knowledge of other people by analysing the links people have created.

The next major revolution on how people create and gain knowledge happened with the emergence of the Web2.0. Compared to Web 1.0 that was based on many new technologies such as HTTP, HTML, Web 2.0 had very little new technologies. The main difference is the changes that happened to the producer-consumer model of Web 1.0. People realised with some technologies to create better user interfaces that everyone can publish on the web. There was no need to be a specialist in some technologies to be able to publish on the web. Thus people who only consumed information earlier also started to publish. The produce-consumer model changed into a “producer + consumer” = prosumer model. (One who both produce and consume). This gave rise to a very interesting phenomena of a whole community producing and consuming information. A typical example is Wikipedia; an online encyclopedia created and used by everybody. In a very short time the community created very large number of web pages full of information on wide range of subject matter. Some of the pages are very advanced, and well referenced while many more need more work and community is invited to contribute to make such information closer to completion.

Due to ICT, now creation and sharing of knowledge is not limited to few experts. The people who were earlier passively consuming knowledge are now becoming creators of knowledge as well. Another very good example is YouTube. YouTube provided a means for people to share their video clips with others. This evolved into a vast library of video clips in a very short time. Today you can find video clips about any thing in YouTube on diverse topic areas such cooking, dancing, gardening, use of computer applications etc.

As now it is very easy to share video, it is no longer necessary to be at the place of the teacher to observe the teacher and learn a skill. Thus Information and Communication Technologies have changed all aspects of generating and using knowledge.

Researchers are now in the process of developing technologies for Web 3.0. Web 3.0 is also called the semantic web. With Web 1.0 and Web 2.0 we tend to access complete information people have created. With Web 3.0 we will be able to ask a query such as “what is the closest restaurant?” probably using a mobile phone that has GPS capabilities. The search engine will then obtain your location from the GPS module, search the websites of restaurants in the area and figure out what is the nearest to you and send that information to the mobile phone. Web 3.0 will be able to extract data from multiple websites and formulate a response to your query. This will have a very significant impact on how we obtain the information that we want further facilitating the access to information.

As you can see from the above, Information and Communication Technologies have revolutionized how we produce, store, access and internalize knowledge. Multimedia technologies have enabled us to use the most appropriate media type to represent chunks of knowledge. Hyperlinks have enabled us to organize our ideas in a manner very close to how we think. The web technologies first enabled experts to publish the information that they have for others to access it. Then it became possible for everyone to publish and consume information. This leads to the creation of large knowledge repositories such as Wikipedia and YouTube.

Due to advances in Information and Communication Technologies now we have access to large amount of information. It is no longer necessary for us to memorize information. What is important is to develop our knowledge to quickly find the relevant information and apply it to solve a problem.



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